CASE REPORT
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Cyanoacrylate Injury to The Eye in A Child: An Emergency Department Approach

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Abstract

Superglue is a common household product with a multi-purpose usage. However over the past 3 decades many cases of accidental installation to the oral, aural, and ocular regions have been reported. We are discussing a case of a 6 years old girl who accidentally applied superglue to her right eye. Her parents attempted first aid by irrigating her eyes and trimming her eyelashes before arrival in emergency department. In the emergency department with analgesia and further irrigation and full separation was achieved. Emergency team are the frontline in any crisis, thus it is important for us to emphasize all the first line of management for superglue injury to the eye.

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INTRODUCTION

Superglue or also known as cyanoacrylate adhesive is widely available to for domestic, medical and industrial usage. Its usage began in 1970s by treating broken tortoise shell and then later applied in war filed to reduce bleeding before the patients received definitive care. Now the application has advanced to implantable medical devices. Superglue is not a regulated item, thus can be easily obtained in any store and is widely available in every household for variety of reasons. Due to careless and poor parental supervision, many children have documented ocular superglue injury. Although there are no serious ocular morbidity caused by superglue, any minor or major injury to eye can lead to serious anxiety as it involves vision. This condition should be managed by the emergency and ophthalmology department. This case report is to highlight the emergency department role. We would like to discuss on water irrigation, trimming eyelashes, application of ointment and acetone usage. Most importantly to address the parents and children

anxiety in any emergency situation.

CASE REPORT

A 6 years old girl was brought to the Emergency Department at 2 AM with complains of right eye pain after mistakenly playing with superglue. On further history, she was playing make up with her cousin in the room. She was applying make up to her face, and assumed the superglue tube as an eyeliner and applied in on her right upper lid. The liquid caused a burning sensation into her eyes. She immediately cried and found her parents. Her parents' quick responds, immediately removed any residue liquid from the eyelids using a towel, and washed her eyes with copious water. According to them, the eyes was fully shut and they resorted to cutting off eyelashes to relieve some discomfort. They immediately brought her to the Emergency Department.

Socially, she is the only child to her parents who originated from Thailand. She is fully immunized and has no previous illness or hospitalization before. She also has no history of allergy. Her parents own a midnight food stall and she is usually with her cousins until the stall closes.

Upon arrival in Emergency Department, she was triaged to Yellow Zone. On general inspection child appeared calm held by her father. She did not appear toxic, able to sit up and respond coherently. Her cardiovascular, respiratory and abdominal examination was unremarkable. There also was no additional bruising or any suspicious lesions on her body. Her eye examination revealed, lids to be completely sealed shut with the exception of a 5-mm opening medially with surrounding erythema. (Fig. 1)

Her eyelashes were completed cut off. No residue of the superglue seen on the eyelids. Gentle palpation of the lids confirmed normal medial and lateral movement of the globe under the closed lids. Child was consoled by our nursing staff, while her parents remained in the exam room to accompany patient. Parents was given clear explanation regarding her condition and further course of treatment. All parents concern was addressed by the emergency doctor.

Irrigation was continued, with warm saline for 20 minutes. Precaution was taken to avoid water from entering her nose and ear and to avoid further discomfort to her eyes. Short breaks was obtained in between irrigation to allow child to relax. Child was allowed to rest in her comfortable position. A referral was also made to the ophthalmology department. After one hour in emergency department, the child had less discomfort and eyes was manage to be opened with gentle separation using fingers. A full

Figure 1: Patients eye on arrival to emergency department. 5mm opening over the medial side and eyelashes completely trimmed off with surrounding erythema.

globe assessment by the ophthalmologist revealed, she had no chemical injury and was allowed discharge home with an appointment to the ophthalmology clinic 1 week later.

DISCUSSION

Superglue contains cyanoacrylate, which are liquid monomers that undergo an exothermic reaction on exposure to moisture, changing the polymers that form a strong bond.[1] Medically, superglue was initially used in veterinary to mend bones and tortoise shell in early 1970s. Later it was used in war to seal wounds and reduce bleeding before reaching the hospital. Today, it is widely used as an implantable medical device for conditions like arteriovenous malformation and intracranial arterial aneurysm.[2]

However, over the past three decade, the packaging of superglue has not advanced much. Its current packaging is similar to a dropper bottle like many cosmetics and eye drop bottles. A literature review in PubMed noted the cause of many accidental superglue injury to the eye are error in identification of eye drops ointment and superglue. A cross sectional study in Iran over a 12 months period noted patient's carelessness as the main culprit with 78.1% cases. Other causes include childhood curiosity and lack of parental supervision documents 11.4 % while deliberate squirting into the eyes during assault is 1%.[3] As noted in the case above, patient was playing with superglue as she mistaken it for an eyeliner without parental supervision.

Many journals reported superglue injuries to the oral, aural and ocular areas. This case report is looking into the emergency treatment and prevention of further damage to ocular injuries at the level of emergency physicians. Superglue ocular injury doesn't seem to cause long term morbidity but it causes direct ocular injuries such as dermatitis, loss of eyelashes, corneal abrasion, chemical keratitis and ankyloblepharon. Traumatic keratopathy can occur when superglue accumulates at the lower eyelids and forms an irregular cast.[4]

Most patients will present to the emergency department or primary care after such events. So it is crucial for emergency department team to get accurate history and previous interventions before suggesting further treatment. We would like to discuss on the general and specific early management in the emergency department for such cases.

As for front liners, we deal with a lot of patients with life-threatening conditions. We must never forget the family members who brought the patient in and their anxiety while waiting for treatment of their loved one. First general step in any treatment, especially among children is to calm the patient and address the parent's anxiety. Always allow parents to accompany young children. Any injury concerning the vision can increase their anxiety too. Thus explaining the eye condition and further management will be helpful for both patient and caregiver. Conscious sedation can be considered in fretful children or uncooperative adults, in order to avoid further damage during manipulation.

Specific management for the eyes is based on two principles. Firstly, to reverse the chemically induced fusion of upper and lower eyelids (tarsorrhaphy) to facilitate further examination of the eye. Second principle is to identify the ocular damage using fluorescein staining and treat accordingly.[5] Our priority in the emergency department is the reversal of tarsorrhaphy as this will not only relieve anxiety, but allow us to look at the eye and identify any direct injury.

Water irrigation, has been one of the mainstay treatment spoken about in many articles. Cyanoacrylate glue polymerizes instantly once it is injected into the eye. Thus, copious water irrigation will be able to wash away the excess. Water irrigation can also slow the rate of condensation into the cyanoacrylate monomer and relieve the fusion of upper and lower eyelids. There are no literature on the recommended quantity of water for irrigation. The first aid recommendation written on the tube is 'in case of eye contact, immediately flush with plenty of water for at least 15 minutes".[6] It is important to remember that the methyl cyanoacrylate bond melts at about 165°C and the upper temperature limit for continuous exposure is about 77°C.[7] Usage of warm water to irrigate can be considered as it will not

only help to loosen the bond, but also provide more patient comfort.

Trimming of the eyelash has also been mentioned in many literatures in addition to other procedures. Trimming not only helps remove the excess superglue particles, but allows the physician to separate the eyelid manually. This procedure can be done without anaesthesia for adults and cooperative children. In younger children ankyloblepheron can lead to amblyopia due to the disturbance in optical axis if left untreated.[5] Thus, uncooperative children might require procedural sedation analgesia for this procedure. In one case report successful application of topical anaesthesia (lidocaine/prilocaine 5% (EMLA)) to perform the eyelid separation and trimming of eyelashes was described.[8] Trimming should be done with careful dissection with forceps or scissors but with extreme caution not to pull the lids apart if they are glued shut.[9]

Uncomplicated partial tarsorrhaphies with no cornea or conjunctiva involvement is recommended to be managed conservatively. The eye has to be fully evaluated to rule out any complication from the superglue direct contact to the eye. If the examination is normal a manual separation using eye ointments is recommended. Recommended ointments are such as polymyxin B-bacitracin-neomycin ophthalmic ointment or mineral oil. Patients apply a pressure patching with mineral oil or antibiotic ointment and daily follow-up to separate the adhesive easily.[9] It takes about 1-4 days in average for the eyes to separate.[10]

Acetone is the common antidote for superglue as it loosens the cyanoacrylate bond. However using acetone may not be advisable for the eye, as it can directly cause chemical injury to the conjunctiva and cornea. It can be used with caution over the eyelid to remove any excess superglue. Application of high molecular weight oil such as margarine has also been documented to help with loosening the superglue bond.[5].

In cases of complete tarsorrhaphies despite all the measures above in the emergency and we are unable to examine the eye, we must consider separation under anaesthesia and urgent ophthalmology referral. All patients should be given a follow up under an ophthalmologist and topical antibiotics upon discharge.

About 25% of the superglue injuries occurred in the paediatrics age groups.[5] More actions should be taken to reduce the accidents. Change in packaging, more warning labels, tight safety caps on the tubing, and bright colour tubing are some of the changes that can further help reduce this incidents. As mentioned before, many incidents have occurred due to accidental application. More effort for patient education should be given through social media, not only for knowledge purposes but for more awareness in handling any toxic or medical products. Parental supervision is also crucial to prevent this incidents occurring in younger age groups.

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